



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

u

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/823,196	03/30/2001	Thomas H. Baum	510	1232

7590 07/09/2002
Margaret Chappuis
ATMI, Inc.
7 Commerce Drive
Danbury, CT 06810

EXAMINER

KIELIN, ERIK J

ART UNIT PAPER NUMBER

2813

DATE MAILED: 07/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/823,196

Applicant(s)

BAUM ET AL.

Examiner

Erik Kielin

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 May 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-85 is/are pending in the application.
- 4a) Of the above claim(s) 13-15, 17-36 and 38-85 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 16 and 37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner: - - -
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: _____

DETAILED ACTION***Election/Restrictions***

1. Applicant's election with traverse of Group I species Ia, claims 1-12, 16-18, and 37 in Paper No. 6, filed 5/2/02 is acknowledged. The traversal is on the ground(s) that (1) the inventions in Groups I through IV are not "independent and distinct," and/or (2) the species within each group are not "independent and distinct," (3) that there may exist "a potential limitation of an applicant's financial resources" in pursuing separate patents, (4) the restriction has been "arbitrarily imposed," (5) the patent may not have protection against obviousness-type double-patenting. None of these reasons is found persuasive for the reasons indicated below.

Regarding (1), the distinctness and independence of the four groups has already been established by the different classifications. Further in this regard, Applicant has stated,

"In the present application, the species which the Examiner has grouped separately are not "independent and distinct. The Group I claims, 1-40 are directed to a CVD precursor composition, while Groups II and III, claims 41-78 are directed to a method of forming a dielectric film on a substrate using the precursors of claims 1-40. Finally, Group IV, claims 79-85, are directed to a dielectric layer made using the precursors and the method of claim Groups I, II, and III."

First Examiner notes, that the Groups I through IV are not the indicated species -- rather these are the independent and distinct inventions. The species indicated were drawn to the composition of the precursor or the composition of the dielectric layer formed. Accordingly the argument is moot as not ever addressing the species requirement.

Second, Examiner respectfully disagrees with the cursory characterization of the claim groupings of the inventions. As noted in the restriction requirement, Group II is directed to

Art Unit: 2813

formation of a dielectric layer which may be used as an etch stop layer, an anti-reflective layer, a capacitor dielectric layer, an interlayer dielectric, a pre-metal dielectric, a passivation layer, etcetera. More importantly however is that Group II is not limited to semiconductor devices and could accordingly be used a protective coating on, for instance, saw blades, since the identity of the substrate is not specified. Group III is specifically directed to a *gate dielectric* --which has a specific purpose for *semiconductor* devices-- and is classified separately from general dielectric formation methods. Furthermore, without the specific indication, in a potential prior art reference disclosing the method for a general dielectric fill, would not anticipate the invention of Group II. Therefore, Groups II and III are both independent and distinct, as presently claimed.

Third, for the purposes of brevity, the independence and distinctness of the inventions of Groups I through IV can be found in the restriction requirement (Paper No. 5). No reasons have been given as to why the *inventions* are not independent and distinct.

Applicant further argues,

“The interdependence of these variations of precursors, methods and device is confirmed --indeed, it is mandated-- by virtue of the fact that the description requirements of 35 U.S.C. 112 compel disclosure of all three aspects of the invention in the one application, which Applicants have filed.”

Examiner respectfully disagrees. There is simply no statutory requirement to *claim* in a single application, patentably distinct classes of chemical compounds (i.e. aminosilanes and the metalloamides of Zr, Hf, Y, and La and their combination) or the separate dielectrics formed therefrom (silicon dioxide or the metal oxide of Zr, Hf, Y, or La) in a single disclosure, simply because some claimed embodiments also mix the compounds into a single CVD precursor mixture and form a mixed silicon-metal dielectric. Moreover, because silicon dioxide and metal

Art Unit: 2813

oxides are vastly different with different properties, and because the precursors themselves may be used to form non-dielectric films, (i.e. epitaxial silicon, a semiconductor, or metal, a conductor, these should be claimed in separate applications because each is a separate invention.

Further in this regard, Applicant's reasoning would prevent any restriction requirement, simply because the inventions were disclosed together. In the instant case, there is no reason why Applicant was required to even disclose the different compounds classes together. Rather they could have been separately disclosed and then the mixture could have been disclosed, as clearly suggested by the restriction requirement. The layers formed from the *separate* CVD precursor compound classes: aminosilanes and metalloamides are unrelated and form unrelated dielectric films with different properties and may also be used to deposit semiconducting silicon or conductive metal layers, respectively.

Regarding (2) above, Applicant is required to provide evidence that the *species* are not patentably distinct. No such evidence has been provided. Furthermore, inasmuch as aminosilanes and metalloamides constitute wholly different classes of chemical compounds, there can be no such evidence that they are obvious variations. Accordingly, the respective dielectrics formed from the precursors are necessarily distinct.

Regarding (3) and (5) above, neither financial matters nor double patenting matters provide evidence that the inventions or species are somehow not patentably distinct. Further regarding (5), if a generic or linking claim is allowed, leading to the withdrawal of the restriction requirement, any claim(s) depending from or including all the limitations of the allowable generic linking claim(s), presented in a continuation or divisional application may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the

Art Unit: 2813

instant application. Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01. Accordingly, Applicant's argument is moot in this regard because such rejections are statutorily permissible.

Regarding (4), Examiner respectfully disagrees that the restriction requirement was "arbitrarily imposed." Rather it was made because numerous independent and patentably distinct inventions were claimed, as noted in the restriction requirement, Paper no. 5.

The requirement is still deemed proper and is therefore made FINAL.

2. During a telephone call to Margret Chappius on 1 July 2002, at approximately 5:27 pm EDT, Examiner indicated that elected claims 17 and 18 had been inadvertently grouped with species Ia, but properly belonged with species Ic. Applicant agreed that Examiner could group the claims as indicated and thereby remove claims 17 and 18 from the elected claims.

Examiner further makes **no** contention that Applicant is changing his/her position on the traversal of the restriction requirement.

3. Accordingly, claims 1-12, 16, and 37 are active and will be examined. Claims 41-85 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Claims 13-15, 17-36, 38-40 withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim.

Information Disclosure Statement

4. The information disclosure statement filed 17 July 2001 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each U.S. and foreign patent; each publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been considered except the patent applications: 09/414133, 07/927134, 07/615303, 07549389, the last of which also has no inventor indicated.

Drawings

5. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: Each of the "G" numbers, for example "G147" in Figs. 2A, 2B, 7A, 7B. While it may not be required to recite each reference number, an indication of what the numbers represent is required for understanding of the figures.

7. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

8. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

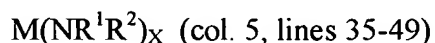
(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

10. Claims 1-12, 16, and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6,159,855 (**Vaartstra**).

Regarding claims 1 and 37, **Vaartstra** discloses a CVD (chemical vapor deposition) precursor composition (Abstract) for forming a thin film dielectric on a substrate, including at least one metalloamide source reagent compound, or a vapor source reagent mixture including a metalloamide source reagent compound, having the formula



wherein M is a metal selected from Zr, Hf, Y, La, lanthanide series elements, Ta, Ti, Al (col. 4, lines 20-31); N is nitrogen; each of R¹ and R² is the same or different and is independently selected from the group consisting of H, aryl, perfluoroaryl, C₁-C₈ alkyl, C₁-C₈ perfluoroalkyl, alkylsilyl (col. 4, line 54 to col. 5, line 13); and x is the oxidation state on metal M. (See also col. 6, lines 6-56.)

Regarding claims 2 and 3, R¹ and R² may be methyl or ethyl (col. 5, lines 8-12).

Art Unit: 2813

Regarding claims 4-7, in the examples noted above in col. 6, tetrakis-(diethylamido)-hafnium (i.e. $\text{Hf}(\text{NEt}_2)_4$) is disclosed at lines 47-48 and both tetrakis-(diethylamido)- and tetrakis-(diethylamido)-zirconium (i.e. $\text{Zr}(\text{NEt}_2)_4$ and $\text{Zr}(\text{NMe}_2)_4$, respectively) are disclosed at lines 50-51 wherein “Et” is standard acronym for “ethyl” and “Me” for “methyl.”

Regarding claims 8-10, the solvents in which the metalloamide precursor are dissolved to form the CVD precursor are disclosed at col. 8, lines 37-53. More specifically, ethers, amines, hydrocarbons (both aliphatic and aromatic) are disclosed. Further regarding claim 8, note that the C5-C10 aliphatic hydrocarbons are preferred and C8 is octane specifically.

Regarding claims 11 and 12, the means by which the CVD precursor may be delivered to the CVD chamber is an intended method of using of the composition and does not have patentable weight in the instant claims drawn to composition. (See MPEP 2112.01 and 2112.02.) Inasmuch as **Vaartstra** anticipates the composition specifically for CVD of dielectric layers, it is seen to be inherent that the composition may be delivered to the CVD chamber by any known method, including those presently claimed.

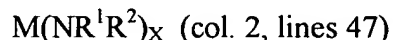
Regarding claim 16 and further claim 37, the precursor composition comprises multiple metalloamide source reagent compounds. (See paragraph bridging cols. 6-7.)

11. Claims 1-7, 11-12, and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5,139,825 (**Gordon et al.**).

Regarding claims 1 and 37, **Gordon** discloses a CVD (chemical vapor deposition) precursor composition (Abstract) for forming a thin film dielectric on a substrate, including at

Art Unit: 2813

least one metalloamide source reagent compound, or a vapor source reagent mixture including a metalloamide source reagent compound, having the formula



wherein M is a metal selected from Zr, Hf, Y, La, lanthanide series elements, Ta, Ti, Al (col. 1, lines 33-35); N is nitrogen; each of R^1 and R^2 is the same or different and is independently selected from the group consisting of H, aryl, perfluoroaryl, C_1 - C_8 alkyl, C_1 - C_8 perfluoroalkyl, alkylsilyl (col. 1, lines 35-43; col. 2, line 47-48); and x is the oxidation state on metal M.

Further regarding claim 37, the vapor source reagent mixture includes carrier gas or ammonia (col. 1, lines 44-50; col. 2, lines 36-39).

Regarding claims 2 and 3, R^1 and R^2 may be methyl or ethyl (col. 2, lines 47-48).

Regarding claims 4-7, tetrakis-(diethylamido)-titanium (i.e. $Ti(NEt_2)_4$) is disclosed at col. 2, lines 51-52 and the metal Zr and Hf are as noted above. (See also col. 5, lines 13-15.)

Accordingly, tetrakis-(diethylamido)- and tetrakis-(diethylamido)- derivatives of Hf and Zr are expressly included (i.e. $Hf(NEt_2)_4$ and $Hf(NMe_2)_4$, $Zr(NEt_2)_4$ and $Zr(NMe_2)_4$).

Regarding claims 11-12, the same reasoning as used above is applied here, Further note that a bubbler delivery system is shown in the cover figure as 10, 12, 14, and 16.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Art Unit: 2813

US 5,583,205 and US 5,726,294 (both to **Rees, Jr.**) disclose lanthanide and actinide series metalloamides including, *inter alia*, alkylsilyl ligands. (See Abstract; col. 2, last paragraph; col. 4, last paragraph; col. 6, lines 27-45.)

WO 00/67300 (**Gordon et al.**) teaches metalloamides with alkylsilyl ligands.

US 5,417,823 (**Narula et al.**) teaches aliphatic hydrocarbons are known solvents for metalloamides. (See col. 2, lines 36-60.)

US 6,348,412 B1 (**Vaartstra**) is a divisional of US 6,159,855, applied above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 703-306-5980. The examiner can normally be reached on 9:00 - 19:30 on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached at 703-306-2417. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Erik Kielin
July 2, 2002